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ABSTRACT

Cross-sectional analysis of 1971-1972 budget elections and expenditure data in 111 large K-12 school districts in Oregon indicates that the "agenda control" and "fiscal illusion" models predict expenditure levels better than the standard "median voter" model. The median voter model assumes that district expenditures are based on the median voter's demand for spending. The agenda control model predicts expenditures on the basis of the budget proposed by the "agenda setter" (usually the school board) and the "reversion level" to which spending falls if a school budget fails. Both these factors interact with voter turnout and income, community size, and the number of elections allowed on one budget. The fiscal illusion model predicts that, insofar as voters lack information on state or federal grant income to the district, they will not reduce spending in reaction to grand levels. Tests on the Oregon data confirm, first, that school district spending was unaffected by grant levels, indicating much voter illusion; and, second, that school boards or other agenda setters seemed to be using the threat of reversion-level closures to increase expenditures beyond the voters' desires. (RW)

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INSTITUTIONAL STRUCTURE OF SCHOOL FINANCE ELECTIONS

Final Report to

National Institute of Education

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by

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INSTITUTIONAL STRUCTURE OF SCHOOL FINANCE

Major Topics

I. INTRODUCTION

II. THE IMPACT OF REVERSION RULES ON SPENDING

III. INTERGOVERNMENTAL GRANTS

IV. FISCAL ILLUSION AND AGENDA CONTROL

V. THE METHODOLOGY OF EMPIRICAL STUDIES

VI. POLICY ISSUES

I. INTRODUCTION

Our research has two central conclusions. First, one must seriously entertain the hypothesis that local funding of primary and secondary education is entirely unaffected by the level of federal and state nonmatching grants. In other words, a dollar of a grant simply increases total spending by a dollar. The funds do not provide local tax relief. Second, in expenditure referenda, school boards appear to exploit the possibility that schools can close if a referendum fails. They appear to use their agenda control powers to propose and pass expenditures higher than those desired by a majority of the voters.

Our conclusion with respect to grants contrasts significantly with the outcomes expected on the basis of conventional economic theory. If voters were fully informed as to the amount of the grant, standard theory tells us that, taking advantage of the fungible aspect of noncategorical, nonmatching aid, the voters would seek to reduce local taxes. Local spending would

then rise by substantially less than one dollar for each dollar of outside aid received. Consequently, we conclude that the funding process operates as if voters were entirely unaware of the substantial amounts of funds received by their school districts.

These conclusions were developed on the basis of a cross-sectional analysis of 1971-72 expenditures for the 115 largest K-12 systems in Oregon.* For this data set, the apparent failure to perceive aid was estimated to have increased expenditures by roughly 30 percent. (See Romer and Rosenthal, hereafter RR, 1980c, p. 34). The seriousness of our conclusions is reinforced by the fact that local spending in Oregon is controlled by a referendum process, where voters have an ooportunity to have direct impact on the budget. One would expect our conclusions also to be valid in environments where the links between voters and the school finance process are more tenuous as when school taxes are established by legislative bodies, by elected school boards, or by the courts.

Indeed the departure point of our research was the realization that public policy has a critical concern with how the structure of governmental institutions affects taxation and

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* Our statistical analysis concerned 111 districts that had school budget referenda. Three other districts, including Portland, failed to hold elections, choosing to operate with their guaranteed statutory spending levels (the "six percent" amounts) plus outside aid. The conclusions above apply to these districts a fortiori. Corvallis, which contained a large university student population making its census data atypical, was also excluded.

expenditures. A sense of a need for change is manifest in various proposals for increased use of initiative and referendum, for tax and expenditure limitations, for sunset provisions, and for zero-base budgeting.

Unlike the research summarized here, economic studies of local public finance and, in particular, school finance have focused solely on the demand side of government spending. Past studies have assumed that spending could be modeled in terms of the demand of some representative voter. This voter is often characterized has having his level of expenditures at the community median of preferred levels. Going one step further, some researchers treat this voter as belonging to a household with median income. (See RR, 1979a, pp. 144, 147.)*

In our research on institutions, we have begun to consider the supply side of spending and how supply and demand interact in a nonmarket environment (RR, 1978, 1979b). What concerns us most is the possibility of bureaucratic or interest group exercise of monopoly power through the use of agenda control. Our empirical studies for Oregon school districts suggest that the median model be rejected. Moreover, we estimate that the use of agenda control can inflate locally financed per student expenditures by 15 percent (a somewhat conservative estimate) to 40 percent (a more speculative estimate) (RR, 1980, pp. 17-18).

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* This report generally refers the reader to the several research papers the project director has written with Professor Thomas Romer rather than repeating longer references to the original literature. However, a complete bibliography and copies of the research papers are provided with this report.

The impacts of agenda control and fiscal illusion on school district spending appear to be virtually independent, in a statistical sense, for our Oregon data set.* Consequently, in Section II, we first summarize the agenda control model. The fiscal illusion model is then discussed in the context of median voter models in Section III. The two models are combined in Section IV, which contains an evaluation of the potential impact on spending were voters well-informed as to the amounts of state aid received by their districts. Some methodological research relevant to our substantive investigations is the topic of Section V. Finally, policy issues raised by the research are discussed in Section VI.

II. THE IMPACT OF REVERSION RULES ON SPENDING

Setters and Reversions

Political economists have only just begun to model complex political institutions. We have deliberately studied a prototypical, simple form of agenda control. The process does resemble the school operating budget or millage referenda that

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* Because of the importance we attach to our fiscal illusion results and because estimating the fiscal illusion models led to complex technical and computational problems (RR, 1980b), we did not carry out certain tasks listed in our proposal to N.E. Specifically, we did not replicate the Oregon study in other states. We have, however, collected a large data set, comparable to our Oregon data, for Michigan. We have also made arrangements for Ohio data, with Dr. Matthew C. Cohen, research analyst for the State of Ohio Department of Education. We expect that some of our research on Ohio will be in collaboration with Dr. Cohen. We will be pursuing these replications and other studies over the next two years under a grant from the National Science Foundation.

take place in some 22 states. In an extreme case, the school board is the agenda setter and proposes a budget that requires approval by a majority of the voters. If the proposal fails, the level of expenditure is a legislatively or constitutionally specified reversion level.

The reversion might be, for example, last year's tax rate (Arkansas), last year's budget plus six percent (Colorado), a specific millage rate (Idaho) or insufficient funds to operate, closing the schools. Closings have indeed occurred in at least Ohio, Oregon, Illinois, Connecticut, an Virginia in recent years. Our stylized example appears to be an accurate representation of the actual process in Arkansas and--with modification to allow for a legally limited number of repeat elections--Ohio, Oregon, Michigan, and several other states.

Our research strictly would apply only to states in which a current expenditure referendum does not affect the reversion in some future year. This is the case in Oregon but not for, example, in Michigan, where voters can enact millages that remain in force for several years. We expect that agenda control will also affect expenditures in these "roll your own reversion" states.

Budget-Maximizing

Our research is based on the assumption that the setter is a budget-maximizer. Technically, a somewhat weaker assumption is possible, but the important aspect is that, relative to most citizens, the setter has a very high demand for spending. This

assumption, motivated by technical convenience, is supported by some descriptive accounts of bureaucracy in general and school finance in particular. Empirically, our work on Oregon shows that expenditure data are better explained by assuming a budget-maximizing setter who seeks to exploit the reversion than by assuming a politician who, seeking to enact the preference of the median voter, totally disregards the reversion in his decison-making.

The Setter Under Certainty

Just how does the setter exploit the reversion? Assume that the setter knows the preferences of the entire electorate and that there is full turnout (or, alternatively, that the setter knows who will vote and also knows the preferences of these voters). This is the implicit assumption in most of the standard median voter work.

First consider the case where the reversion is at or above the preferred spending level of the median voter (RR, 1979b, pp. 565-569). Clearly the median voter and all voters who want lower spending levels will not approve any proposal in excess of the reversion. So if a majority vote is required for approval, the setter is stuck with the reversion. Of course, if the reversion does not happen to be just at the median voter's preferred spending level, actual spending will be in excess of that desired by the median voter.

Next consider the remaining possibility: the reversion is below the median voter's preferred spending level (RR, 1979b, p. 570). Some proposals above this level will leave the median voter better off than the reversion. Faced with a take-it-or-leave-it choice, the median voter--and at least all voters who want higher levels--will vote for some proposals higher than the median. The setter is able to threaten the electorate with the reversion, and he again obtains a spending level higher than the reversion. Just how high spending actually is depends not just on the median voter's preferences but on the preferences of all the voters. Indeed, the pivotal voter may no longer be the voter with the median preferred level (RR, 1978, pp. 36-38). Nonetheless, not only does spending exceed the median preferred level, but spending increases as the reversion falls. Highest spending is obtained for an extremely low reversion, such as one that would lead to closing the schools.

In our empirical work on school districts, we have assumed that, in addition to spending increasing as the reversion falls, spending increases dramatically below a certain threshold reversion. The threshold can be considered to be the level needed to keep the schools in operation (RR, 1980, p. 7).

The data show that there is indeed a threshold. Being just below as against just above the threshold leads to the 25 percent to 40 percent difference in expenditures--those below spend more--mentioned earlier.

On the other hand, the data do not support the certainty model. Above the threshold, expenditure is increasing, not decreasing, in the reversion (RR, 1980. p. 16).

The Setter Under Uncertainty

Clearly, however, the setter does not have the complete information called for in the classical voting models. Although community preferences change (due to such factors as migration and shifts in income, property holding, and family size), the setter may have fairly good information about preferences. In the Oregon context, districts have been operating under the current reversion rule since 1916. There has been ample opportunity for learning. A possibly greater source of uncertainty arises with variations in turnout. In addition to turnout effects that depend upon the proposal and the reversion--matters we have not investigated--turnout is affected by weather, by what other elections are on the ballot, and by various personal factors concerning illness, vacations, etc.

We have introduced uncertainty into the setter model in the simplest possible manner. We asume that the setter maximizes the expected budget. We assume further that each individual has a turnout probability that is independent of his preferences, the reversion, and the setter's proposal. Even with this very simple form of uncertainty, few conclusions can be drawn about how the reversion affects the level of spending. For reversions at or above the median preferred level, we know that uncertainty has to make the setter better off than he was in the full information

case. Both the proposed budget and the expected budget will be higher than the certainty budget, which, recall, was equal to the reversion. For very low reversions, such as those which would force closing the schools, we know that uncertainty typically works against the setter. The uncertainty budget will be less than the certainty budget. For less extreme reversions that are still below the median preferred level, just about anything is possible. Expected spending cannot only be greater or less than the certainty outcome, but it can even be less than the preferred level. Moreover, the expected budget can be increasing or decreasing in the reversion. About all that can be done is to see empirically whether the reversion has an effect. It does.

The Reversion Effect

Most of the reversion effect takes place at the threshold. In our sample of 111 districts, districts that are below the threshold had locally financed expenditures that, according to our preferred statistical model, were 16.5 percent higher than in districts just above the threshold (RR, 1980b, p. 17).

In addition to the reversion, the other variables in our model are median household income, the tax share incurred by a home of median value, average family size, and state (noncontingent, lump sum) aid. To increase locally financed per student spending by as much as it is increased when a district falls below the threshold, it would be necessary to increase real income by more than 15 percent or to add nonresidential property such that the median home's tax share falls by over 40 percent or

to decrease family size by 60 percent. (Computed from RR, 1980b, Table 2, Col. 2.) Policies that would affect any of these variables by the requisite amount are well nigh impossible in either political or economic terms. State aid, in turn, as discussed below, had little if any effect on the amount of locally financed spending in Oregon. In contrast, it would appear that the state legislature could readily affect local spending by changing the reversion rules.*

Districts That Do Not Hold Elections

A change in the reversion rules could also affect the small number of districts that do not pass a budget in addition to affecting those that are below the threshold. In the certainty model, if the reversion is above the median ideal point, no election will be held and the local portion of the reversion will be fully spent. In the uncertainty model, if all elections in a sequence fail, the reversion will be fully spent. This local portion is commonly known as the base. Although the school board is not obligated to spend its base, budget-maximizing implies it will do so (RR, 1980b, pp. 8-9).

In 64 instances between 1970-71 and 1976-77, school boards did not pass a budget. In nearly all such cases, however, no election was held. Such results would appear to contradict

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* The above conclusions are subject to the usual reservations placed on cross-sectional analysis.

budget-maximization under uncertainty where the setter would be expected to exploit fully the available sequence of elections (see below). This may, however, only reflect the possibility that the setter's potential gains are less than his cost in holding the election.For example, Portland held elections only in 1971-72. In that year it tried three times to increase local spending over the base by 10 percent to 15 percent. All attempts lost by 3-to-2 margins or more (RR 1979b, Table 1). These results show that no substantial increase, if voted on, could pass in Portland and that perhaps no increase at all could pass. Moreover, in Portland's case, its large size means that random turnout factors will not be an important source of uncertainty.

Portland has always assessed 100 percent of its base. As enrollment fell by one-fourth between 1970-71 and 1976-77, the base kept increasing at six percent annually. These figures and the lopsided defeats of 1971 suggest that Portland's budget exceeded the median preferred level. In the other 57 observations, 99.1 percent of the total base was assessed (RR, 1979b, Table 1). These observations appear to support the hypotheses of budget-maximizing and expenditure in excess of median preferred levels. Given enrollment shifts and changes in the growth rates of real and nominal incomes, it is difficult to imagine that the median preferred level of property tax assessments for education would be growing at six percent in nominal terms.

Uncertainty and A Sequence of Elections

We noted above that variable turnout will affect the setter's proposal and expected budget even if the setter is neutral with regard to risk and seeks only to maximize the expected budget. For a given "shape" of the distribution of voter preferences, how well the setter fares is affected by the turnout probability and community size.

In the case where the setter can hold but one election, if the setter's optimal proposal under uncertainty would be above what he would receive under certainty, then the expected budget increases as either the turnout probability drops or the community size falls. From the viewpoint of a maximizer of the per student budget, the best situation here is to have low turnout and a small school district. This circumstance is sure to arise when the reversion is above the preferred expenditure level of the median voter (RR, 1979b, pp. 577-578).

Inversely, if the setter's optimal proposal under certainty would be below what he would receive under certainty, then the expected budget increases as turnout increases or the community size increases (RR, 1979b, pp. 577-578).

In reality, the setter is entitled to more than one try at passing the budget in most states. In Oregon, this number has varied between five and eight dates per year, depending on current state law. Even if voters voted strategically, the setter can never be worse off than if only one election were permitted, for the setter can always choose to hold but one election. When voters vote as if each election were the last, we

can show that setters use a decreasing sequence of proposals. The last proposal will be the proposal that would be used if just one election could be held (RR, 1979b, pp. 579-581). In this schema, it is obvious that the expected budget increases with the number of elections authorized by state law. In 903 cases in Oregon where additional elections were held between 1970-71 and 1976-77, the amount requested from the voters was raised in only 2.8% of the elections; it was cut in 63.1% of the cases and left unchanged in the remaining 34.1% (RR, 1979b, Table II). The pattern is reasonably consistent with the predictions of our uncertainty model.

Changing the Tax Base

Oregon school districts are permitted to hold elections to change the tax base (RR, 1980b, p. 8). Prior to 1978, these elections were optional. (The elections affected the base only in future years, rather than in the current year's budget voting.) Presumably, changes in the base could be used to lower the base in Portland's case and to raise it to less threatening levels in districts with existing bases that put them below the threshold. However, proposals to change the base had to originate with the school board-setter. In turn, the budget-maximizing setter's preferences are, under certainty, directly opposed to those of a majority of the voters (RR, 1980b, pp. 22-23). The setter will want to either raise the base above current spending levels or reduce it to a very low level, even zero. As such, there would be a standoff, and no elections would be held.

This appears to be largely the case, since only 11 of over 300 school districts held elections to change the base in 1972 and only 18 in 1976 (PR, 1980b, Table 5).

Some of these districts tried more than once. Only 5 of 34 attempts passed, again in testimony to the diametrically opposed interests of the setter and a majority of the voters.

Efforts to exploit uncertainty may explain the few largely unsuccessful attempts to change the base. They may also arise out of sheer frustration. Having lost three budget elections in 1971, the Portland district attempted to change its base in 1972. The board proposed a $10 million increase in base even though the 1971 elections gave a fairly strong signal that the voters wanted a lower base (see above). The attempt was soundly defeated.

Districts did not attempt to raise the base just to avoid the consequences of having to close the schools. Only one base change proposal was below the current spending level and two just matched it. In contrast, 24 proposals were for a base in excess of current spending, a request consistent with short-run budget-maximization. An extreme example is furnished by Medford, which requested a $13,500,000 base in a 1976 election when the locally financed portion of the budget was only $9,324,000. The proposal lost.

In 1978, the legislature forced districts into holding elections to pass the base. We do not have data on these elections except for newspaper accounts indicating that substantial numbers of elections were successful. Perhaps the school closings in 1976 have had a substantial effect. However,

at least one district, Pistol River, met its obligation by raising its base from $0 to $1! For the present, we are only sure, as explained in greater detail in RR, 1980b, pp. 24-26, that the 1972 and 1976 elections were far more supportive of the budget-maximizing setter model than they were of the standard median voter model.

III. INTERGOVERNMENTAL GRANTS

Our discussion of the setter mechanism has essentially been lodged in the context where each voter is faced with a tax that is proportional to some aspect of his income or wealth, the property tax being an example (RR, 1979b, pp. 565-566). The voter trades off private consumption versus public expenditure along, technically, a budget constraint that is a straight line. All of our conclusions, however, are valid for the [weakly concave (RR, 1978, p. 30)] budget constraints that would be generated by most forms of intergovernmental grants, be they lump sum, open-ended, or closed-ended matching grants.

Lump sum grants like Federal Title I education aid and many state education grants have caused problems in economic analysis. Giving a community or school district a fixed amount of money is, in terms of the standard representative voter or median voter models, equivalent to a shift in the voter's income (barring corner solutions) (RR, 1979c, pp. 5-8). Empirically, however, several studies suggest that grants stimulate spending far more than do the equivalent shifts in income (RR, 1979c, p. 1). Our own study for Oregon reaches this conclusion with respect to state aid (RR, 1980c).

Fiscal Illusion

To deal with these "flypaper effects" which show "money sticks where it hits", economists have abandoned the classical microeconomic model in favor of the concept of "fiscal illusion."

Attempts to model fiscal illusion in terms of median voter models have asserted that grants cause voters to be fooled into underestimating the price of additional units of education or some other public expenditure [e.g., Courant et al, (1979), Oates (1979)]. We believe, however, that voters are relatively well informed about the price of marginal units. Ordeshook (1979) shows that Oregon voters are extremely well-informed regarding their housing values (survey responses were checked against the actual assessments) and property taxes. At least home owners--who are usually seen as the pivotal voters--should be well aware of what they will bear in any increase in local spending or millage rates.

Where the voters would seem more likely to lack information is with regard to the grant itself. They do not know the total dollars available for spending. Such a view is further suggested by press reports and our own interviews which suggest that some Oregon school boards deliberately obfuscate the amount of state aid in preparing their budgets.

We first examine fiscal illusion in the context of a standard median voter model (e.g., Inman, 1978). In such a model, we have schematically,

Total per student expenditure, E_a,

depends on

median voter's income, median voter's tax price,

median voter's number of children, other factors.*

Consistent with other studies, "income" is essentially median income for the community, and "children" is average number of primary and secondary students per household. "Tax price per student" is the ratio of median housing value to total assessed value, (the price per dollar of total spending) multiplied by total enrollment to obtain the price per dollar of per student spending. Other factors, usually demographics whose effects are not predicted theoretically, were omitted given Oregon's relative homogeneity.

In what we term the grant illusion model, voters are hypothesized to perceive only $(1-\rho)A$, where A is per student aid and ρ is an unknown parameter. If $\rho = 0$, perception is complete. If $\rho = 1$, fiscal illusion is complete. Then, perceived student spending is $E_a - \rho A$, and the schematic relationship becomes:

Perceived total per student expenditure, E_p,

depends on

median voter's income (adjusted for aid perception),

median voter's tax price, median voter's number

of children, other factors.

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* The log-linear equation is shown in RR (1980c p. 17).

Although the local tax rate is based on E_p, the school spending authority is assumed to get away with spending the resulting surplus of $E_a - E_p = \rho A$.

The grant illusion model is equivalent to another model where voters misperceive the total assessed valuation of the school district (RR, 1980c, p. 18). However, if we assume no illusion about the grant ($\rho = 0$), the estimates of tax base illusion are ludicrous, whereas the estimate of grant illusion is reasonably stable for a wide range of assumptions about the tax base illusion.

As alternatives to our grant illusion model, we also examined price illusion models based on the works of Courant et al. (1979) and Oates (1979). Courant et al. have the voters impute the grant to the local tax base while their personal taxable holdings remain constant. This leads to an underestimate of the true tax price. We estimated two variants, dubbed one shot and iterative, of their model. In the one shot model, the unperceived surplus is fully expended as in the grant illusion model. Another process operates in the iterative case. In both variants, we had to introduce a parameter that capitalizes the flow of the yearly grant into an equivalent addition to assessed valuation (RR, 1980c, p. 12). Oates also develops an underestimate of the true tax price, basically by claiming that the true tax price is multiplied by $(E_a - \rho A)/E_a$. Both the Oates and Courant et al. models were subject to detailed criticism on theoretical grounds (RR, 1980c).

Empirically, the grant illusion model is preferred both to the standard median voter model and to the alternative price illusion models. Table 1, reproduced from RR, 1980c, shows the results. They strongly indicate that fiscal illusion is complete (ρ close to 1.0). They are the basis for the conclusion, mentioned in the introduction, that a dollar of a grant increases total spending by a dollar.

The following subsection contains a detailed discussion of the results for the median voter-fiscal illusion models. (Nontechnically-oriented readers may choose to skip this part.)

Empirical Results

The various illusion models were estimated using the Full Information Maximum Likelihood procedure (FIML) of the well-known TSP package, with standard errors calculated by the method of Berndt et al. (1974). To summarize briefly the results displayed in Table 1, the grant illusion model and the one shot model clearly dominate the iterative and Oates models. A substantial degree of illusion is indicated. The illusion parameter is estimated to be nearly one (.971) in the grant illusion model and, if not constrained, substantially greater than one in the one shot and Oates models. Our contention that the setter is likely to spend any unperceived surplus is supported by the very poor performance of the iterative model. Within the constraints imposed by the log-linear demand function and theoretical considerations, the grant illusion and one shot models provide, in a statistical sense, nearly identical improvements over the

full information median voter model. The caveat concerning "the constraints imposed by the log-linear demand function" must be taken seriously. The substantial increase in the likelihood (to -678.56) afforded by the unconstrained one shot model, even though the estimated illusion and capitalization parameter values (3.264 and 32.660, respectively) are implausible, discloses that our formal models have failed to capture important aspects of the statistical information in the data. This may be due to some combination of (a) inappropriate models of illusion, (b) the log-linear function being an inadequate specification of demand, or (c) incorrect specification of the political-institution process. While we investigate the last problem in Section IV, we will continue to be plagued by some degree of specification error. An important advantage in continuing with the log-linear form--and, indeed, in presenting the median voter models in Table 1 before estimating the setter model--is in preserving comparability with the previous literature.

We now discuss Table 1 in detail. The first two columns serve to present the fully informed median voter benchmark and to show the small discrepancies in asymptotic standard errors as calculated by FIML and the conventional standard errors resulting from OLS.

The grant illusion model leads to a highly significant improvement in the likelihood. The asymptotic chi-square probability (with 1 d.f.) is $.15 \times 10^{-5}$. This result is mirrored in the illusion parameter's estimated value being over six times the estimated standard error. The value of .97, however, is not

significantly different from 1.0, offering strong support for a full flypaper effect. With respect to the median voter model, the elasticities of income, price, and number of students all increase substantially over their estimates in the fully informed median voter model.

If no constraints are placed on parameter values, the one shot model gives a still higher value for the likelihood function. At the maximum, however, the capitalization parameter appears excessively large and, more importantly, the illusion parameter estimate of 3.264 is distant from one (the standard error being only .283). This is clearly unacceptable since $\rho > 1$ would imply that voters would decrease their effective disposable income upon receipt of the aid. Imposing the constraint of $\rho = 1$ significantly lowers the likelihood. The chi-square probability (with 2 d.f., appropriate since the constraint is imposed ex post) is $.16 \times 10^{-5}$, nearly identical to the grant illusion model result.

Pinning down the reasonable values to be expected for the capitalization parameter is, at the least, difficult. The estimate of 19.4 suggests that, ceteris paribus, the same spending would result from a grant as from the addition to the tax base--holding the number of children constant--of an assessed valuation 19 times the amount of the grant. We conjecture that this trade-off weights the grant excessively. Coupling this conjecture with the observation that the one shot model really places an unacceptable value on the illusion parameter and with

our previous theoretical reservations, we admit to a preference for the grant illusion model.

The results we obtained for the iterative model were clearly unacceptable. The extra parameter introduced problems of identification. The extreme values found for the weighted average and illusion parameters witness the identification problem. The weighted average parameter α is obviously above the upper bound of 1 and, in addition, the capitalization parameter is negative.

When the constraints $\rho = 1$, $\alpha = 1$ are imposed, convergence occurs readily but the capitalization parameter becomes excessively large. Moreover, the likelihood is only marginally greater than that of the fully informed median voter model.

The Oates model also has a problem with unacceptable parameter estimates. In addition to its likelihood being below that of both the grant illusion and one shot models, the estimate of 1.68 (in eq. 21) of the illusion parameter is too large relative to one. Indeed, as was the case for the one shot model, constraining ρ to 1 forces a substantial drop in the likelihood.

The estimated elasticities for income, price, and students are consistent with the range of value found in earlier studies of school expenditures (see Denzau, 1975) and, for income and price, local spending more generally. However, the results also show that fiscal illusion is an important addition to the earlier studies.

Institutional Theory

In addition to fiscal illusion, the fact that grants and income differentials do not have identical effects may reflect institutional considerations. Specifically, unlike the median voter model, the setter model does not, even without fiscal illusion, predict identical effects from a lump-sum grant and an equivalent income shift (RR, 1980a, pp. 13-22). The reason is that a grant changes both voters' incomes and the reversion while the equivalent income shift changes incomes only.

To elaborate this point, consider a school district where incomes rise but state and federal aid and the share of local property wealth remain unchanged. The aid, barring the district falling below some operating threshold, is available for spending even if the voters turn down the setter's proposal. The sum of aid and any local expenditure that is not subject to voter approval, such as an amount increasing nominally at six percent, constitutes the reversion. Thus, a simple rise in income does not change the reversion. In contrast, increases in grant levels leading to an "equivalent" income increase do change the reversion. The school district now has more money to spend without the voters' approval.

We have examined the special case where the pivotal voter is the same individual before and after the income or grant (RR, 1980a, pp. 13-22). For very low reversions, the grant reduces the setter's ability to threaten voters. Consequently, spending would increase less rapidly with a grant than with an income shift. This is at odds with the empirical observations.

However, for moderate reversions, spending can readily increase more with a grant than with an income increase. Finally, for very high reversions we are guaranteed that spending will rise by the amount of the grant but remain totally unchanged by an income increase.

Cut-Off Grants

The preceding discussion of the setter mechanism has been based on the assumption that grants and local institutions induce concave budget constraints. This is needed to obtain the central result that, for low reversions, spending under certainty will be inversely related to the reversion.

If grants induce nonconcave budget constraints, there are in general no strong results. However, a potentially interesting special case can be considered. (The following reinterprets Proposition 2' in RR, 1978.) Assume lump-sum or matching grant financing of a local educational program. However, the grantor desires to "punish" "rich" or "indulgent" spenders by cutting off all aid if spending exceeds a certain level. (Concavity fails because of the cut-off.) All of our previous results continue to apply to this case.

While we are unaware of any education grants of this form, cut-off grants do seem to be approximated in at least one area. Consider total financing of a mass transit system other than operating revenues. The subsidy is composed of aid and a local subsidy. The local community has a trade-off between financing

from operating revenues and the subsidy. If demand is sufficiently inelastic and the budget must be balanced, the subsidy will fall as operating revenues rise. Now San Francisco was threatened in early 1980 with a shut off of its state subsidy because operating revenues were too small. Thus the mass transit grants would seem to be of the cut off type. The San Francisco MUNI loses aid if it "indulges" in too much subsidy of its riders. Were referendum voting to be used to decide spending in a context where "cut off" aid was used, our analysis of the setter model would continue to apply.

IV. FISCAL ILLUSION AND AGENDA CONTROL

Because the grant illusion model of voter misperception of state aid and the setter model offer alternative explanations of the flypaper effect, it is of interest to combine the two. The schematic becomes:

Perceived total per student expenditure

depends on

Income, Price, Students, Other Factors,

and Reversion Effects.

Empirical Results

The model shown in Table 2 adds two reversion variables to the grant illusion model shown in Table 1. The previous estimates for income, price, students, and especially, illusion are virtually unchanged. (Correspondingly, the reversion effects are very near to those claimed in Section I.) Since the illusion parameter is statistically indistinguishable from 1.0, the flypaper effect for state aid in Oregon appears to be explained by the illusion model and not by institutional considerations. However, a subtle interaction occurs between the aid perception and the reversion effect. If aid were in fact fully perceived, many school districts now estimated to be below the threat threshold would rise above it, leading to about a 15 percent decrease in expenditures in those districts.

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* Of course, this statement assumes that the other parameters of our regression equation would remain unchanged.

A more dramatic decrease in expenditures that would result from a fully informed ($\rho = 0$) electorate would occur through elimination of the simple flypaper effect. In all districts, removing flypaper would be estimated to drop expenditures by about 30 percent. (Other effects of much smaller magnitude would, to an extremely slight degree, offset the threshold and flypaper considerations and increase expenditures. See RR, 1980c, p. 35.)

Because these findings show large potential differences in spending if voter information is changed, they should be subject to substantial additional research before firm conclusions are reached. On the one hand, they definitely should be confirmed with time-series as well as cross-sectional data. On the other, the possibilities for changes in spending, either by changing the reversion rules or by changing voter information, may be muted by collective bargaining considerations. In 1971-72, Oregon teachers did not engage in collective bargaining and had never struck.* The situation changed dramatically in the past decade. Our models do not explicitly take collective bargaining into account. Thus, they require testing with more recent data.

Fiscal Illusion vs. Institutional Models

Fiscal illusion and institutional approaches need to continue to be considered jointly in future work. While the

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* Based on interview with Oregon School Board Association officials.

lump-sum transfers of state aid in Oregon appear to be wholly or partially ignored by the voters, voters appear to be more aware of the..transfer districts received from (largely county-wide) Intermediate Education Districts (RR, 1980, pp. A2-A4). Unlike state aid, removing the IED receipts from the reversion, income, and spending worsens, rather than improves our statistical fit. Thus, the effect of changes in IED receipts vs. changes in income would appear to conform to the preceding discussion whereas changes in state aid have effects that appear to operate through fiscal illusion. Now the IED payments are financed through property taxes that are earmarked for education. The IEDs themselves had constitutional reversions and conducted elections to obtain higher funding levels. The allocation formula was stable through time. In contrast, state aid takes a route that is more opaque to the voter. The funds come out of general state revenues. Both the level of funding and the allocation formula have been subject to shifts over time. Thus, the differential effects we have observed for IED receipts and state aid appear to be consistent with others' observations that fiscal illusion relates to voter information (RR, 1979a, pp. 160-161).

Since the regression results indicate full perception of the IED transfers, which are essentially intergovernmental lump-sum grants, IED funds may have induced significant effects opposite to flypaper through their impact on the reversions. The IED transfers were abolished in 1978. Elimination of the IEDs should have significantly lowered the reversion for many districts.

Thus, analysis of 1979 or 1980 expenditure data would provide an important test of our model.

V. THE METHODOLOGY OF EMPIRICAL STUDIES

In RR, 1979a, we developed an extensive critique of studies that were based upon the median voter model or even proposed to test it.

All of these studies encounter an identification problem we named the multiple fallacy (RR, 1979a, pp. 144, 148, 150). Even if the median voter model statistically accounted for the data, there is no way to tell if expenditures are everywhere at the level desired by the median voter or are, say, twice or one-half that level. A similar problem arises in our own regressions. We can only say that the reversion has an effect on spending, not how spending is relative to the median voter's preferred level. (In any event, in a society that strongly protects minority interests on the one hand and requires supramajorities for constitutional amendments on the other, there is clearly no normative reason to focus on the median voter's preferences.)

A second problem encountered in the earlier literature is the fractile fallacy (RR, 1979a, pp. 145, 150, 153). No previous studies we are aware of test whether median income gives better predictions than other fractiles of the income distribution. Our own research (RR, 1979b, Table 4) shows virtually equal fits for all income deciles from the second to the seventh, the fourth decile actually giving a slightly better fit than the fifth or median decile. We thus suspect that the characteristics of the pivotal voter cannot be sharply identified on the basis of aggregate data. The basic reason is porportionality in income distributions across cross-sections. (See RR, 1979b, Table 1.)

A third methodological problem, that of aggregation, has been identified by our research associate, R. Filimon (1979). In econometric studies of demand for private goods, it is common to use as regressors average income and other averaged characteristics. Lau (1977a, 1977b) and others have shown reasonable conditions where this process will allow, using aggregate data, consistent estimation of the underlying demand of the "average" or "representative" consumer. The aggregation works largely because markets clear by averaging processes.

In contrast, the regressors in studies of the demand for publicly provided goods are median income and other median statistics, reflecting the "pivotal" nature of the models by they of the median voter or setter variety. Filimon has shown that such a process can lead to considerable bias in estimation. The bias is unlikely to vanish as the voting population becomes large. This means that estimates of the demand for publicly provided goods, including our own, should be greeted with more skepticism than similar studies for market goods. Methods for the analysis of political resource allocation require much further elaboration.

A final methodological comment is that earlier studies rarely test median voter model against alternatives. (The setter model is one possibility.) Bergstrom and Goodman (1973) did show that estimates of the same demand model varied widely across states. Since they controlled for a large number of economic and demographic variables, there is a suggestion that institutional differences among states are crucial. In their extensive

studies of Switzerland, Pommerehne and his associates have indeed found, like we have, that institutional considerations do make a great difference (RR, 1979, pp. 151, 160-161).

VI. POLICY ISSUES

Our policy discussion is couched in terms of what one would do to either raise or lower expenditures. While the preceding discussion has often been phrased in terms of how much expenditures depart from those predicted by a median voter model, we do not seek to give any normative weight to the median voter's preferences. Neither in social theory nor in U.S. political practice can one find justification for basing policy on majority rule. We note both that courts have often protected "minority rights" over legislation passed by majority rule and that supramajorities are required in certain state referenda, in certain votes in the U.S. Senate, and to amend the constitution. Thus we are content to indicate, rather than evaluate, changes in spending that might be induced by institutional change.

1. The reversion is an important policy variable in referendum situations. Those seeking to expand expenditures should favor reducing reversions to zero or increasing them far beyond current spending levels. Those seeking to limit government expenditures will look for moderate reversions. In many cases, expenditures would be lower if the new reversions were set somewhat below current spending levels rather than at current spending levels. (For jurisdictions with historically low reversions, current spending will reflect the setter's threat.)

Even if reversions can be modified to reach some spending goal in the short run, there is the problem of drift in time. No automatic adjustment of the reversion, whether stated in nominal

terms or indexed, is likely to work very well over a long period. For example, in a period of both inflation and falling real income, a reversion based on full indexation will quickly generate a spending level higher than that desired by most voters.

Consequently, thought should be given to modifying the referendum process. If the median voter outcome was desired, the Florida system described by Holcombe (1977) could be used. In that system, each voter writes his preferred level of expenditure on the ballot, and the median is enacted. That this system has disappeared even in Florida says long on the esteem granted the median voter.

Alternatively, some form of initiative coupled with the school board's proposal could be considered. Setters would be more constrained if they had to win against some proposal other than the reversion.

2. With respect to uncertainty, those seeking larger expenditures should seek to increase the number of elections available to pass a budget or millage. Those seeking to limit expenditures would prefer just one election. Those seeking to limit expenditures ex ante should thus be prepared to pay the cost of occasional school closings ex post, just as they now are prepared to pay the cost of lengthy school strikes.

3. With respect to grants, those seeking to increase total spending should foster fiscal illusion with respect to grants. State and federal grants to local jurisdictions should be given minimal publicity. Those seeking to reduce local taxes given

receipt of the grant should give maximum publicity to the grant. This can readily and cheaply be done. In the era of computer-printed, return address labels, the IRS could readily inform taxpayers of the per student and per capita federal aid his school district and municipality have received. The state income tax forms could be used to similar effect. Referendum ballots could inform voters about outside aid and total spending as well as about the amount of local lines.

A potential consequence of more information, however, is less predictability for the grantor. Especially in the case where fiscal illusion promotes "pure flypaper," a state legislature can be relatively certain, as in Oregon, that an additional dollar of state aid will have minimal impact on local taxes. If voters have no illusion about the aid, the response is much more difficult to predict, even in the simple setter model. In turn, other state and local finance institutions are even more complex than the setter-referenda situation.

4. Extreme caution should be exercised in using any current economic models of local public goods for forecasting purposes. The models are generally cross-sectional and the stability of their parameter estimates have not been subject to verification with time series. They all may have severe problems of aggregation bias. Because institutional factors are not modeled, estimates based on one state's data will usually be wholly inappropriate in another state.

With respect to education, the problems caused by the presence of private school alternatives (not a major problem in

Oregon) have not been adequately modeled. (RR, 1979a, p. 157).

5. With respect to consolidations, larger districts have less uncertainty from turnout variations, ceteris paribus. The degree of uncertainty in turn interacts with the reversion to affect expenditures.

A more systematic effect on expenditure from consolidation policy may result as follows. Assume the setter is himself a voter but comes from the high end of the distribution of preferred expenditures. In a small, homogeneous community, the setter's preferences will be nearly identical to those of the median voter. But, as the community grows larger and more heterogeneous, the setter's preferences diverge from those of the bulk of the electorate. Thus, in addition to causing voters to believe that the schools are no longer "theirs," consolidations can intensify the conflict inherent in the setter situation. Indeed, we suspect that the setter model is accurate only in reasonably large communities. We note to this effect that the budget more frequently passes on the first try in small districts.

Consolidations can lead to monopoly power via the setter mechanism we have described. They accentuate it by limiting the voter's ability to more among competing jurisdictions. Consolidations may have benefits with respect to racial integration. We doubt that they also have general "economy of scale" benefits. Any benefits should be weighed against the costs of developing setters with monopoly power, a power that is

accentuated by the reduction of opportunities for spatial mobility.

6. To improve predictive capacity, in addition to further theoretical work, data collection procedures need to be improved. The preponderance of cross-sectional work has resulted largely because the census is not annual. Enrollment, voting, and spending data is available annually. A key variable, residential and nonresidential property assessment breakdowns are generally missing at the school district level. Variables like median income and median housing value are generally taken from the census. Better property assessment data could be had relatively simply by annual sample audit of assessment rolls in a sample of districts. Annual income data would be more difficult to obtain.

Table 1. MEDIAN VOTER-ILLUSION MODELS

	Model and Equation Number									
	Median Voter OLS (14)	Median Voter FIML (14)	Grant Illusion (16)	One Shot (18)	One Shot ρ=1 (18)	Iterative (20)	Iterative ρ=1, α=1 (20)	Oates (21)	Oates (21')	Oates ρ=1 (21) or (21')
Coefficient										
Constant: β_0	2.217 (1.024)	2.217 (1.127)	-1.302 (1.539)	-3.395 (2.773)	-0.681 (1.458)	-4.294 (1.635)	0.648 (1.178)	-0.681 (1.458)	-0.639 (1.448)	1.057 (1.205)
Income: β_1	0.478 (0.111)	0.478 (0.122)	0.816 (0.165)	1.033 (0.297)	0.761 (0.157)	1.055 (0.162)	0.626 (0.122)	0.761 (0.157)	0.757 (0.156)	0.590 (0.130)
Price: β_2	-0.225 (0.030)	-0.225 (0.032)	-0.360 (0.048)	-0.262 (0.098)	-0.338 (0.046)	-0.675 (0.088)	-0.314 (0.046)	-0.338 (0.046)	-0.335 (0.046)	-0.280 (0.039)
Students/ Family: β_3	-0.208 (0.068)	-0.208 (0.066)	-0.299 (0.085)	-0.490 (0.147)	-0.287 (0.082)	-0.183 (0.069)	-0.229 (-0.067)	-0.287 (0.082)	-0.286 (0.081)	-0.228 (0.069)
Illusion: ρ or w	0 n.a.	0 n.a.	0.971 (0.141)	3.264 (0.283)	1.0 n.a.	$.18 \times 10^{-4}$ $(.18 \times 10^{-4})$	1.0 n.a.	1.690 (0.109)	1.699 (0.108)	1.0 n.a.
Capital: k	---	---	---	32.660 (3.110)	19.432 (11.195)	-31.875 (3.624)	66.353 (32.114)	---	---	---
Weight: α	---	---	---	---	---	$.90 \times 10^{7}$ $(.99 \times 10^{7})$	1.0 n.a.	---	---	---
Std. Error of Dist.: σ	.1439	.1439	.1688	.2859	.1678	.1215	.1399	.1626	.1632	.1468
Log-likelihood of Total Per Student Expenditure	-699.26	-699.26	-687.44	-678.56	-685.92	-682.94	-695.61	-688.09	-688.13	-693.29

Standard Errors of Estimates Shown in Parentheses

TABLE 2

SETTER MODEL WITH GRANT ILLUSION

Coefficient		
Constant:	β_0	-2.464 (1.592)
Income:	β_1	0.823 (0.174)
Price:	β_2	-0.367 (0.055)
Students/Family:	β_3	-0.270 (0.078)
Reversion Threat:	β_4	0.151 (0.043)
Reversion Slope:	β_5	0.184 (0.076)
Reversion Threshold:	μ	211.60 (38.40)
Illusion:	ρ	0.973 (0.203)
Log-Likelihood of Total Per Student Expenditure		-682.34

APPENDIX

Romer and Rosenthal (1978, 1979a, 1979b, 1980a, 1980b and 1980c) are enclosed as the Appendix.

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